

Efficacy of traditional medicines:

Maya traditional medicines and cultural development in Belize



By

Victor Cal, Belize Indigenous
Training Institute, Belize, CA

John Arnason, Jonathan Ferrier,
Brendan Walshe-Roussel, uOttawa

Todd Pesek, MD Cleveland State U.



Indigenous Q'eqchi' Maya in Belize

- Inhabit 43 rural villages in S. Belize
- Traditional healers provide primary health care needs





Indigenous Q'eqchi' (Kekchi) Maya Healers in Belize Central America



The Q'eqchi are descendants of Ancient Maya: ex. Sacred Site Caracol Belize



Maya Cosmovision

- Tree of Life
 - Yaxche: *Ceiba tree*
 - Represents Heaven, Earth, Man, the Underworld
 - Interconnectedness of all things
- Health and Disease
 - Mental, physical and spiritual balance
 - Culture bound syndromes
 - *Awuas, Bilis, Pasma, Susto*, Evil winds



Maya spirituality: ancients putting copal incense into sacred fire



Copal

Modern Maya ceremony



Placing copal into sacred fire



Maya Gods of Medicine

– Several gods related to medicine

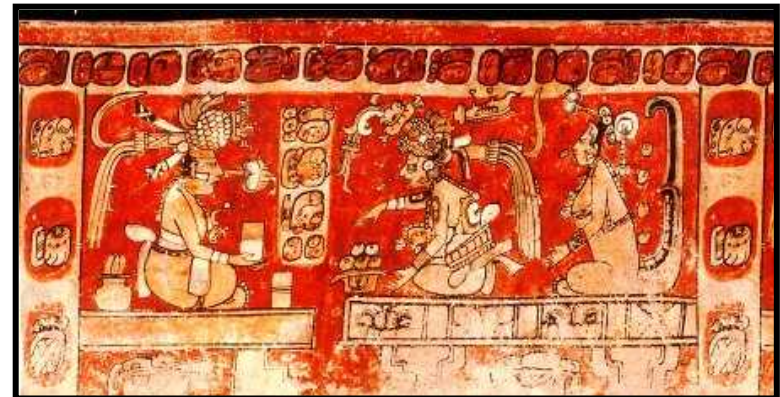
- **Itzamna**: Founder of the Maya culture, showed people to grow maize and cacao, as well as writing, calendars and medicine.
- **Ixchel**: Jaguar goddess of midwifery and medicine. Wife of Izamna



Itzamna



Ixchel



Tikal Lord with Itzamna and Ixchel

First scientists: Ancient Maya Ethnomedicine (Classic and Post-Classic Periods)

- Herbal medicine
 - Priest practitioners
 - Hundreds of plants used
 - Medicinal plant gardens



Dresden codex

Maya healers today hold similar beliefs and ancient medicinal knowledge





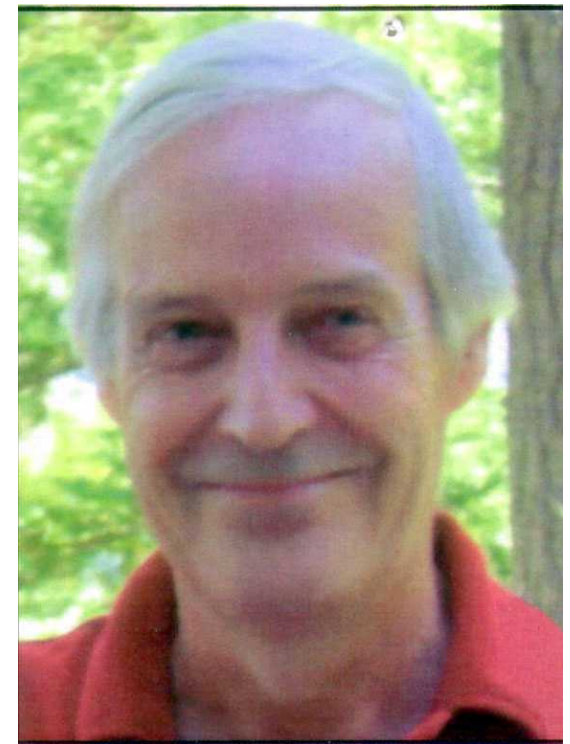
- Healers of S. Belize know the uses of hundreds of rainforest medicinal plants.
- Their tropical forest is considered one of the “biodiversity hotspots” for world conservation.

Belize Indigenous Training Institute :

mission to create indigenous
development and preserve culture



Original BITI offices in Punta Gorda Town



Kevin Knight - ICC
helped start BITI

In 1998 BITI formed the **Kekchi Maya Healer's Association**
Mission: to contribute to health and well being of people and to
respect the harmony of nature and mankind



Founding elder of Kekchi Maya Healer's Association
Albino Maquin



Membership: Maya healers who possess traditional knowledge of plants and the art of traditional healing



New Members are:

- Indigenous persons
- Have trained as traditional healers
- Are practicing healers
- Must be voted into association

Objectives

- To form an alliance of traditional healers to learn from each other and work on common problems and activities.
- Preserve and protect traditional knowledge
- Educate youth
- To heal and to do no harm
- To obtain government recognition of traditional healing
- To establish a botanical garden



Itzamma botanical garden:

Itzamma is the place of Itzamna, God of Wisdom



Healers started garden
to have medicinal plant
near to patients

75 acres at Indian Creek
Belize

Healers replanted
medicinal plants from
remote forest sites

More than 200 species
All rainforest plants

Plants were collected in pristine sacred places in Maya mountains then transplanted to the Izamma garden





Rubiaceae (Coffee family)



Remedy for men



Remedy for
women

Collaboration with University of Ottawa and Cleveland State University
Improving the garden for school visitors: installing water pump,
shelter and outhouses.





Two types of plants:

1: Plants for traditional use
in healer ceremonies (ie
prescription-like use)

Ex: Used for mental health

Healing ceremony combines spirituality and plant use:



Spiritual leader celebrates four cardinal directions representing
earth, air water and fire

2. Choosing Plants for Public Use

Ex: Ginger (*Xan xir*) - not a sacred ancient traditional plant, but very safe and effective for nausea - can be given to public for self care





Fevergrass (*Mes iha*)
For colds & flu



So saul pim
For insect bites

Phytomedicinal products



Tea



Bag for spices,
incense or dye



Repellent
cream

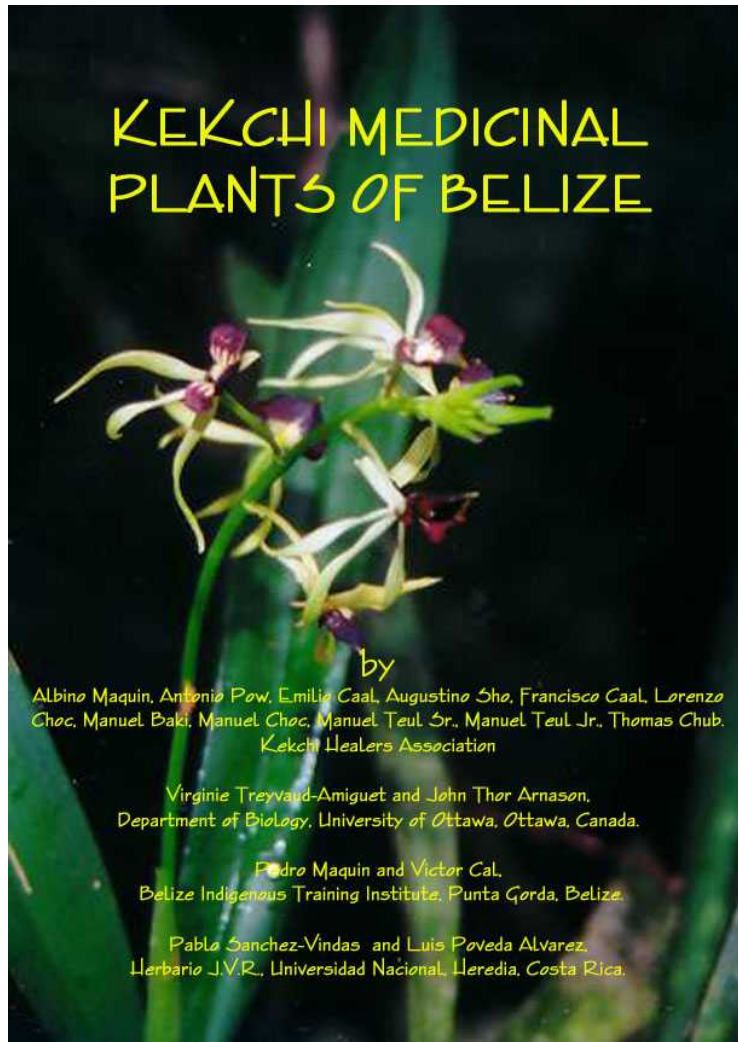


Tincture

Teaching youth about traditional culture at Tumul K'in Maya school



Handbook publication



Handbook of Kekchi medicinal plants

Provides a book to promote the transmission of the traditional knowledge and to teach the use of medicinal plants to younger Kekchi

Book is copyrighted and details about the preparations are not provided to protect the intellectual property of the healers and to avoid the self medication

Activities: research validating traditional medicines.

Cat's claw traditional use for pain and swelling

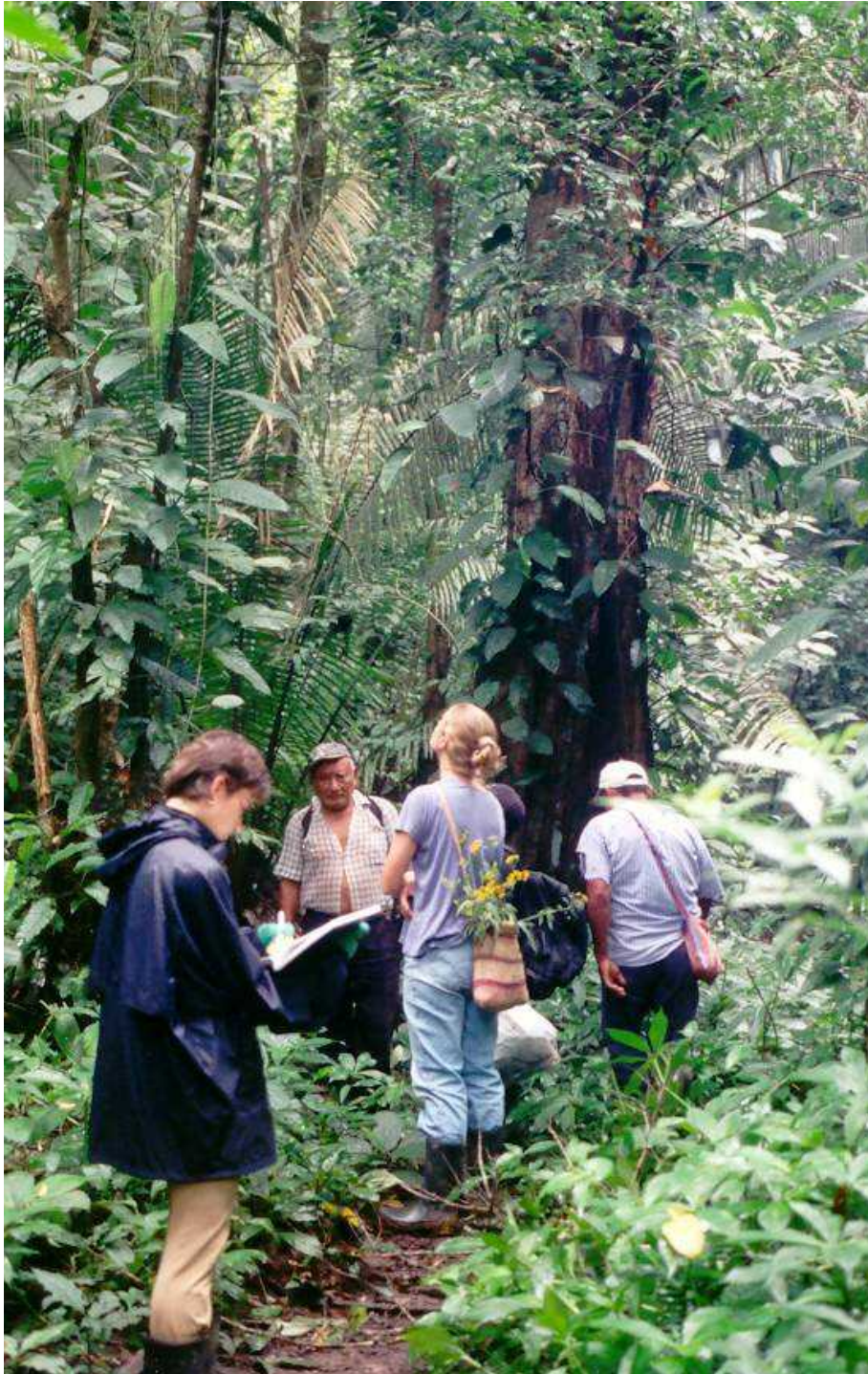
Collected for lab tests as anti-inflammatory



Part 2. Validating traditional medicine



- KMHA & BITI
- John Arnason, Virginie Treyvaud, Jonathan Ferrier
- Brendan Walshe-Roussel



1. The ethnobotany:

Ph.D. student

Virginie Treyvaud

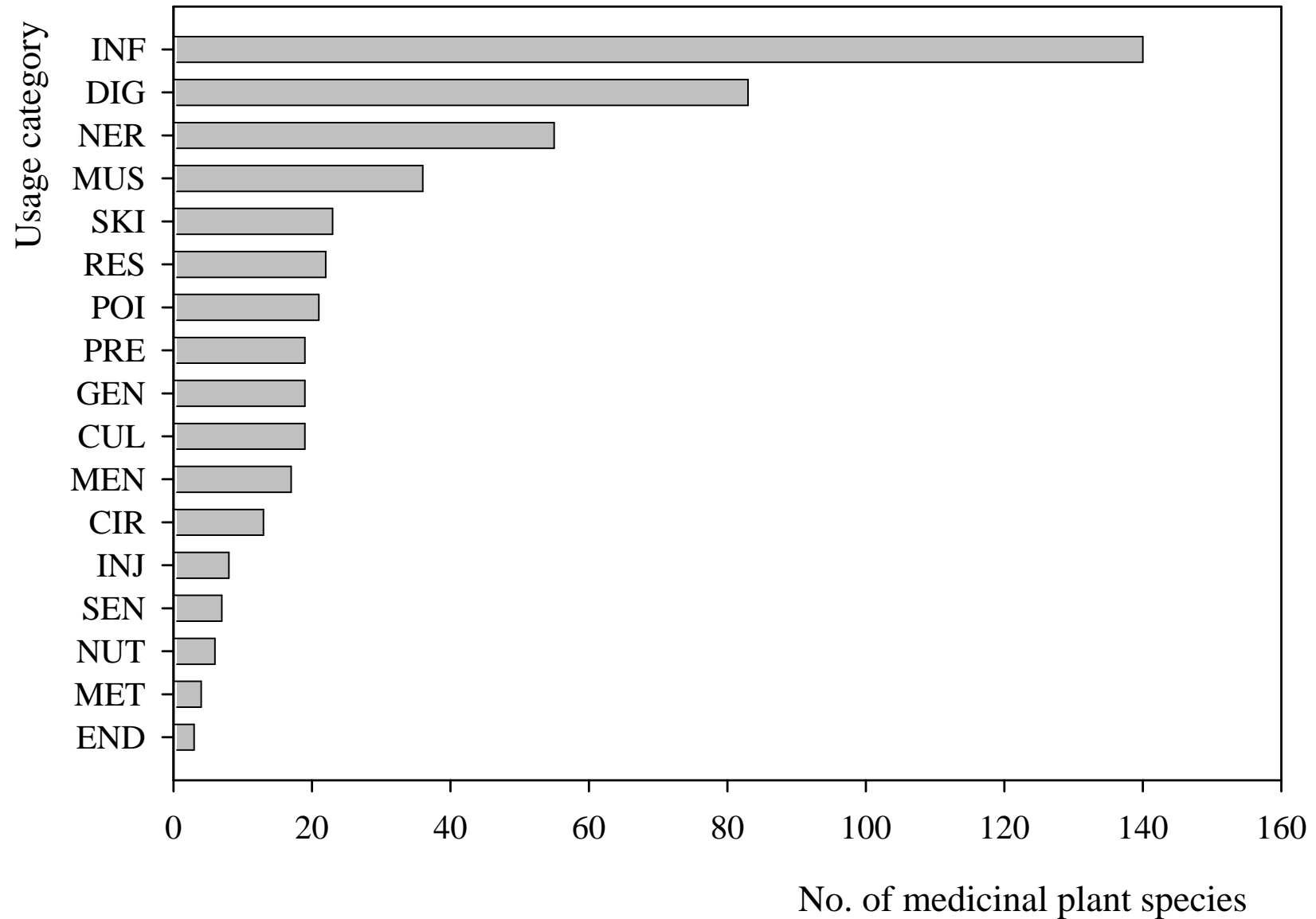
Amiguet and 10 healers

prepared the consensus

Ethnobotany using

Quantitative methods

169 plant species were collected in the Q'eqchi' pharmacopoeia



Informant Consensus Factor

M. Heinrich et al. 2000., *Phytotherapy Res.* 14: 479-488.

- $F_{ic} = \frac{nur - nt}{nur - 1}$
- F_{ic} = informant consensus factor
- nur = number of use-reports in each Usage Category
- nt = number of taxa used



Q'eqchi' ethnobotany: Quantitative analyses

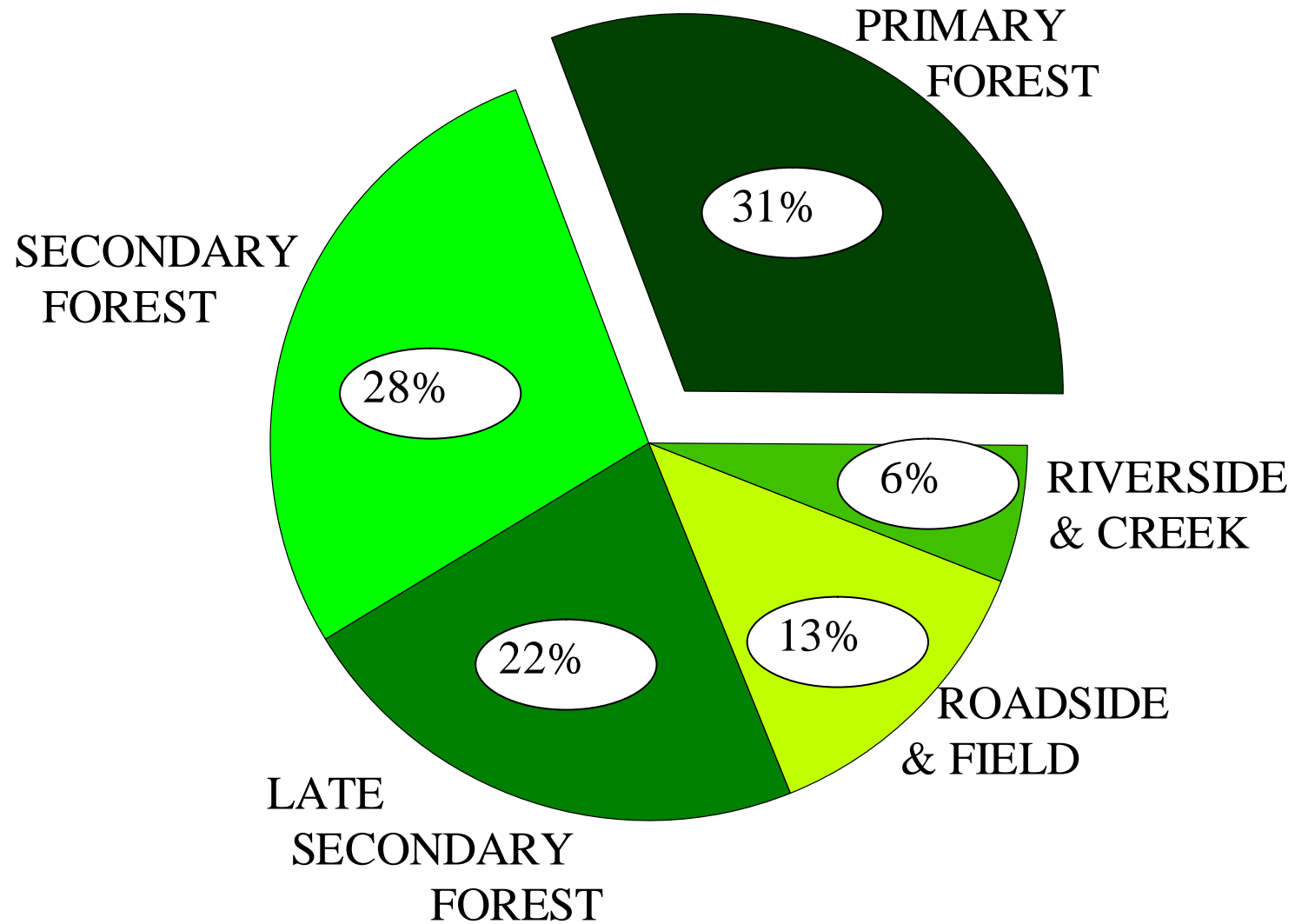
Informant consensus factor (F_{ic})

Category of disorders	F_{ic}
Endocrine System Disorders (END)	0.81
Nutritional Disorders (NUT)	0.77
Genitourinary System Disorders (GEN)	0.76
Poisonings (POI)	0.76
Muscular-Skeletal System Disorders (MUS)	0.72
Digestive System Disorders (DIG)	0.71
Respiratory System Disorders (RES)	0.70
Nervous System Disorders (NER)	0.69
Infections/Infestations (INF)	0.68
Mental Disorders (MEN)	0.67
Culture-bound syndromes (CUL)	0.58
Skin/Subcutaneous Cellular Tissue Disorders (SKI)	0.58
Metabolic System Disorders (MET)	0.57
Pregnancy/Birth/Puerperium Disorders (PRE)	0.57
Circulatory System Disorders (CIR)	0.52
Injuries (INJ)	0.36
Sensory System Disorders (SEN)	0.25

$$F_{ic} > 0.6$$

High consensus for ten categories of disorders

A Rainforest ethnobotany



Ethnobotanical Survey

Healers recognize and treat a large number of mental health/neurological symptoms with herbs and prayers



Ailment	No. healers treating ailment	No. use reports ^a	No. plants used ^b
<i>Susto</i> (fright)	6	26	14
Epilepsy	6	71	41
Headache	6	71	45
Madness	6	50	33
Insomnia	5	7	3
Stress	3	3	2
Numbness	5	7	5
Depression	3	4	4
Total	6	266	82

Epilepsy and Susto

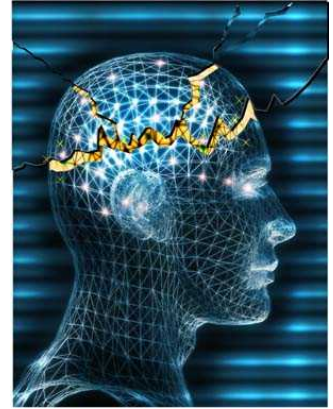
Epilepsy

- Seen as “spirit loss” by the Maya and a serious condition needing intervention with plant medicines, ceremony
- 41 plant used! By 10 healers

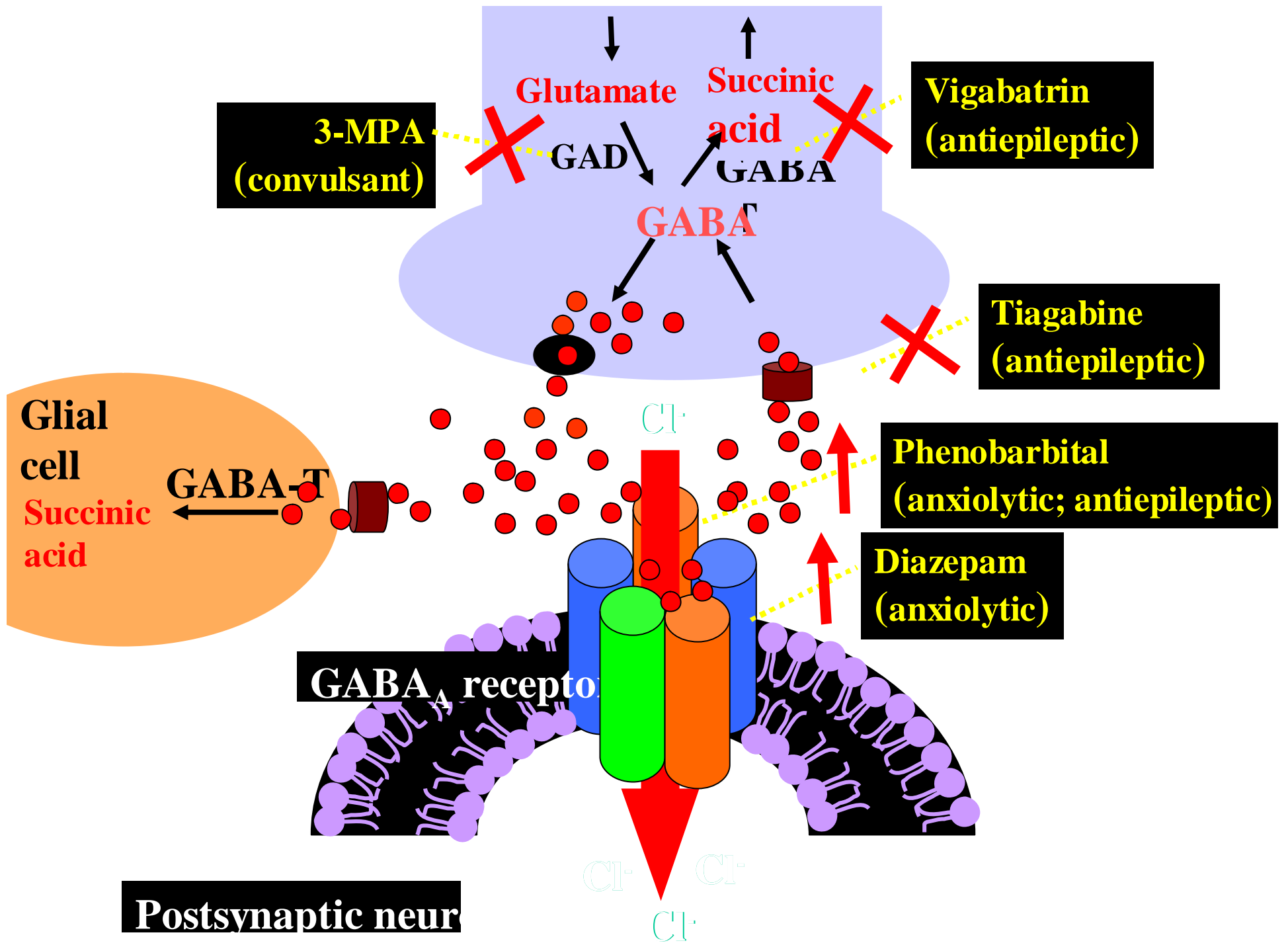
Susto

- A culture bound syndrome in which a fright can cause disease symptoms- we hypothesized a relation to generalized anxiety
- 14 plant species used

The GABA system



- Gamma-aminobutyric acid (GABA) is the main inhibitory neurotransmitter in the mammalian brain
- Low GABA levels are associated with anxiety and epilepsy
- **GABA Hypothesis** - Increasing GABA and/or GABAergic activity in the brain may help to alleviate these conditions



Quantitative Ethnopharmacology:

- **Informant Consensus**

Used to identify plants with high potential for activity

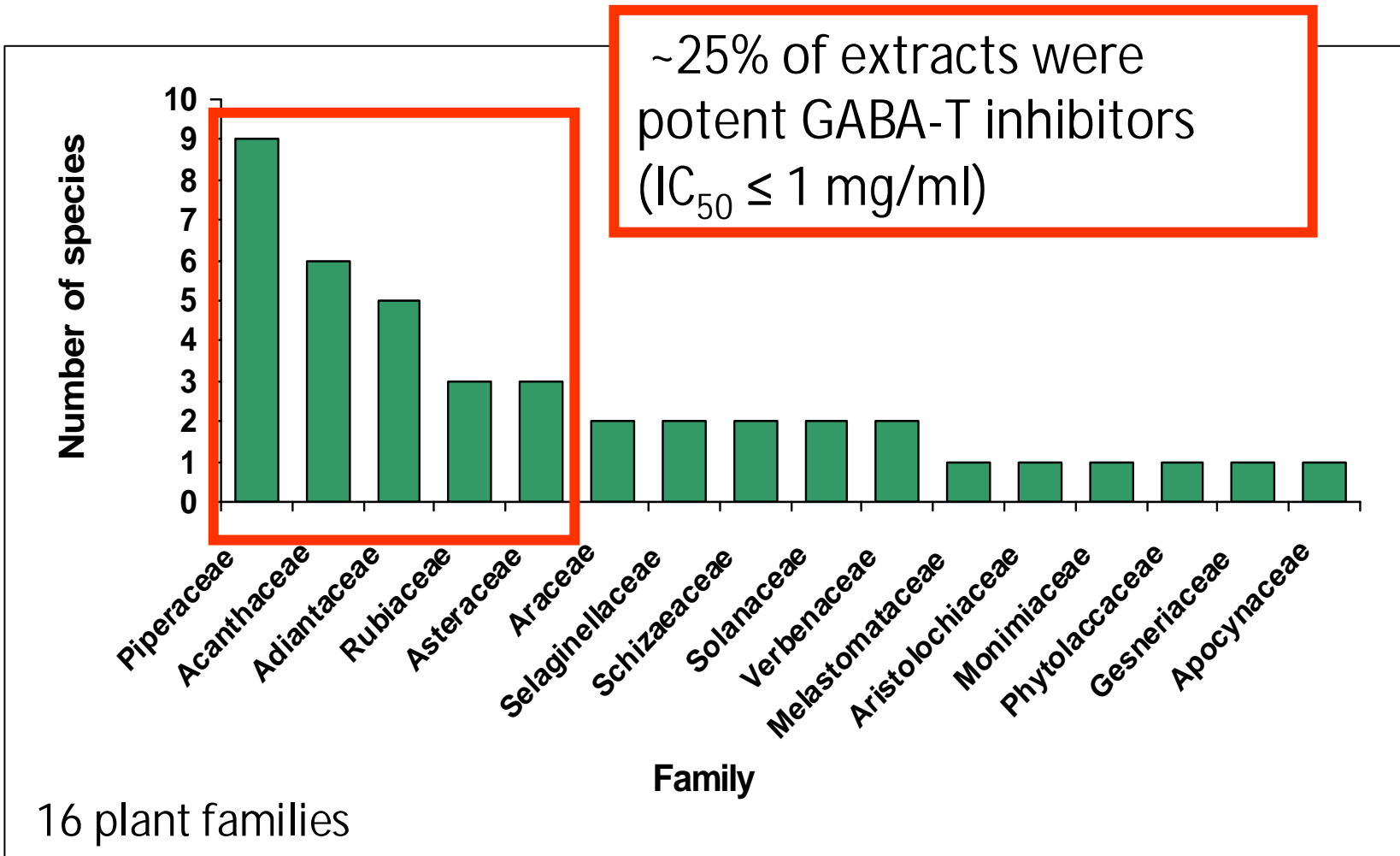
Relative frequency (RF) of use for epilepsy:

$$\% \text{ RF}_{\text{epilepsy}} = \frac{\# \text{ healers using a species for epilepsy}}{\text{total \# healers interviewed}} \times 100$$

- **Pharmacological target for epilepsy GABA-T inhibition**

- Tested ethanolic extracts; rat brain tissue

Plant families used in epilepsy

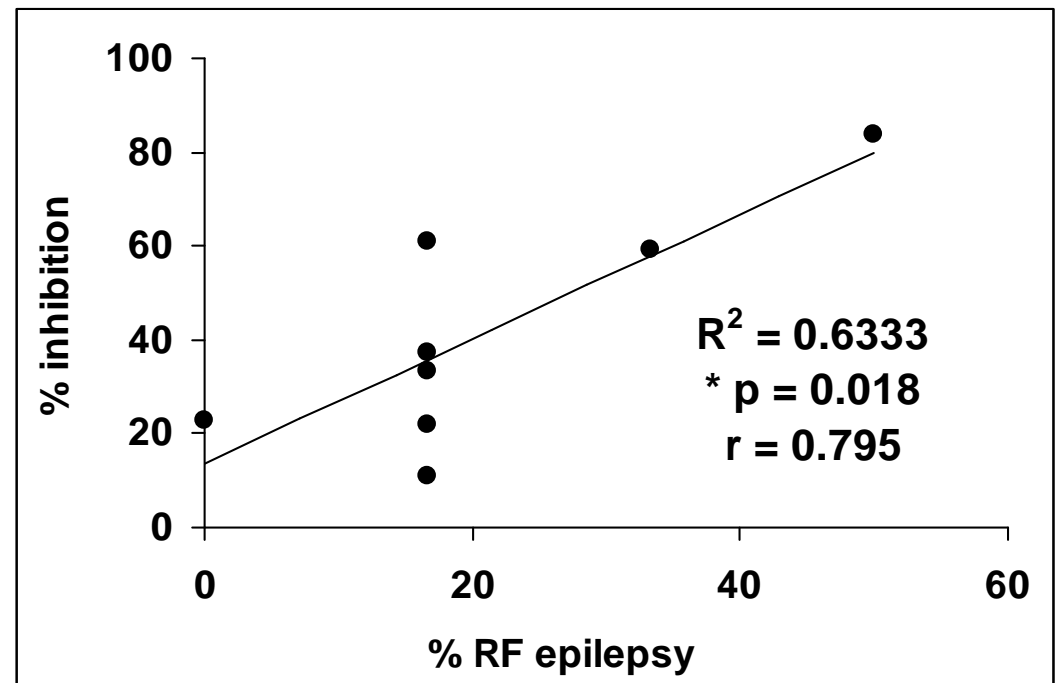


Traditional knowledge vs. biological activity

Piperaceae correlation
(8 species) is very high

- For all families, a significant moderate positive correlation (34 plants) between %GABA-T inhibition and relative frequency (RF) of use.

$$r = 0.36, p < 0.05$$



GABA-T inhibition: extracts tested at 1 mg/ml

Piperaceae

Pepper family



- *Piper* species have also been traditionally used for epilepsy & related neurological disorders in other cultures
 - Kava, *Piper methysticum* (South Pacific islands)
 - Black pepper, *Piper nigrum* (TCM)
- Contain nitrogen compounds: piperamides, e.g. piperine
- Piperamides are the antiepileptic agent

Epilepsy Summary

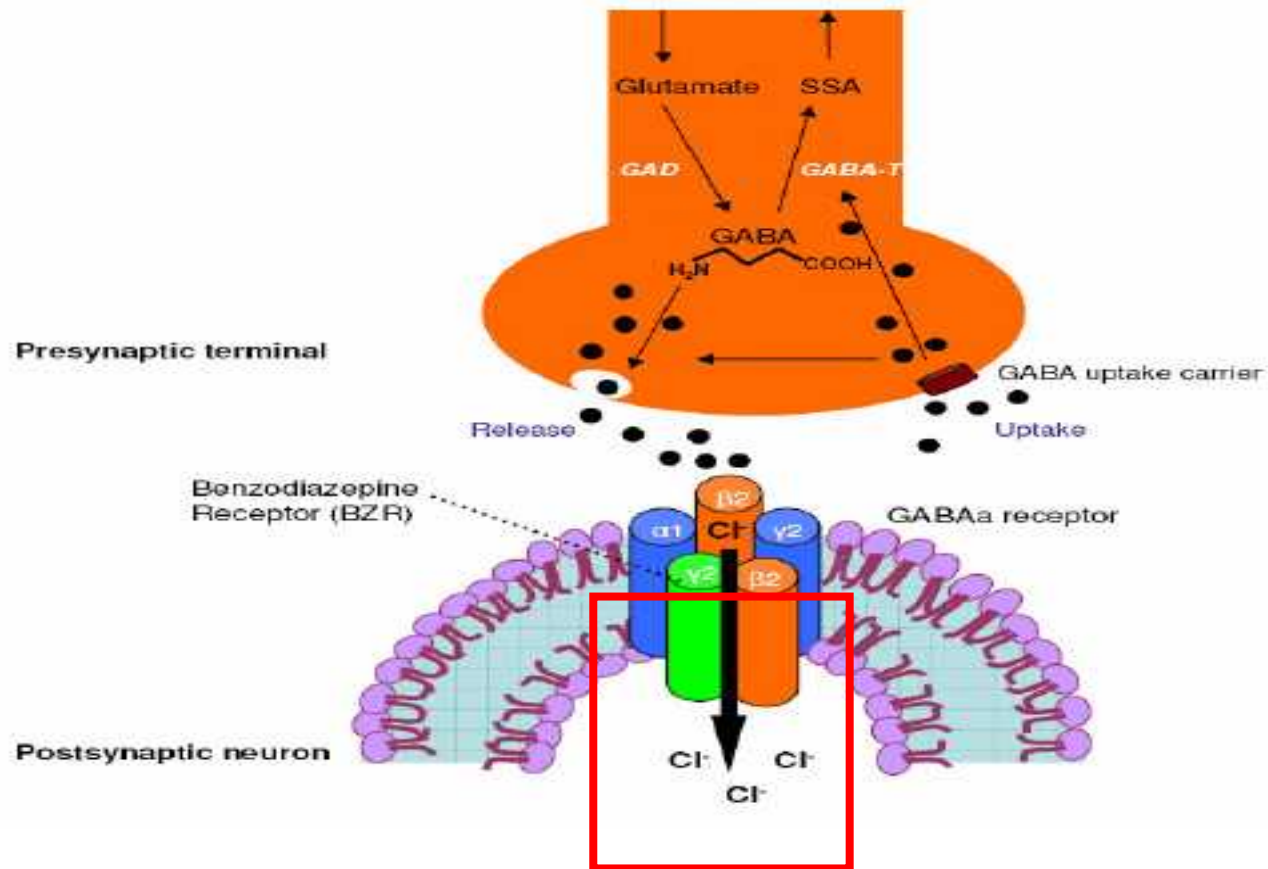
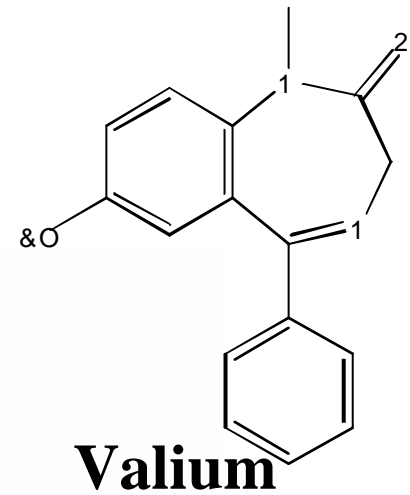
- Anti-Epileptic plant use by Maya has a pharmacological basis in GABA T inhibition

Anxiety:

La tentacion de San Agustino -- Diego Riviera

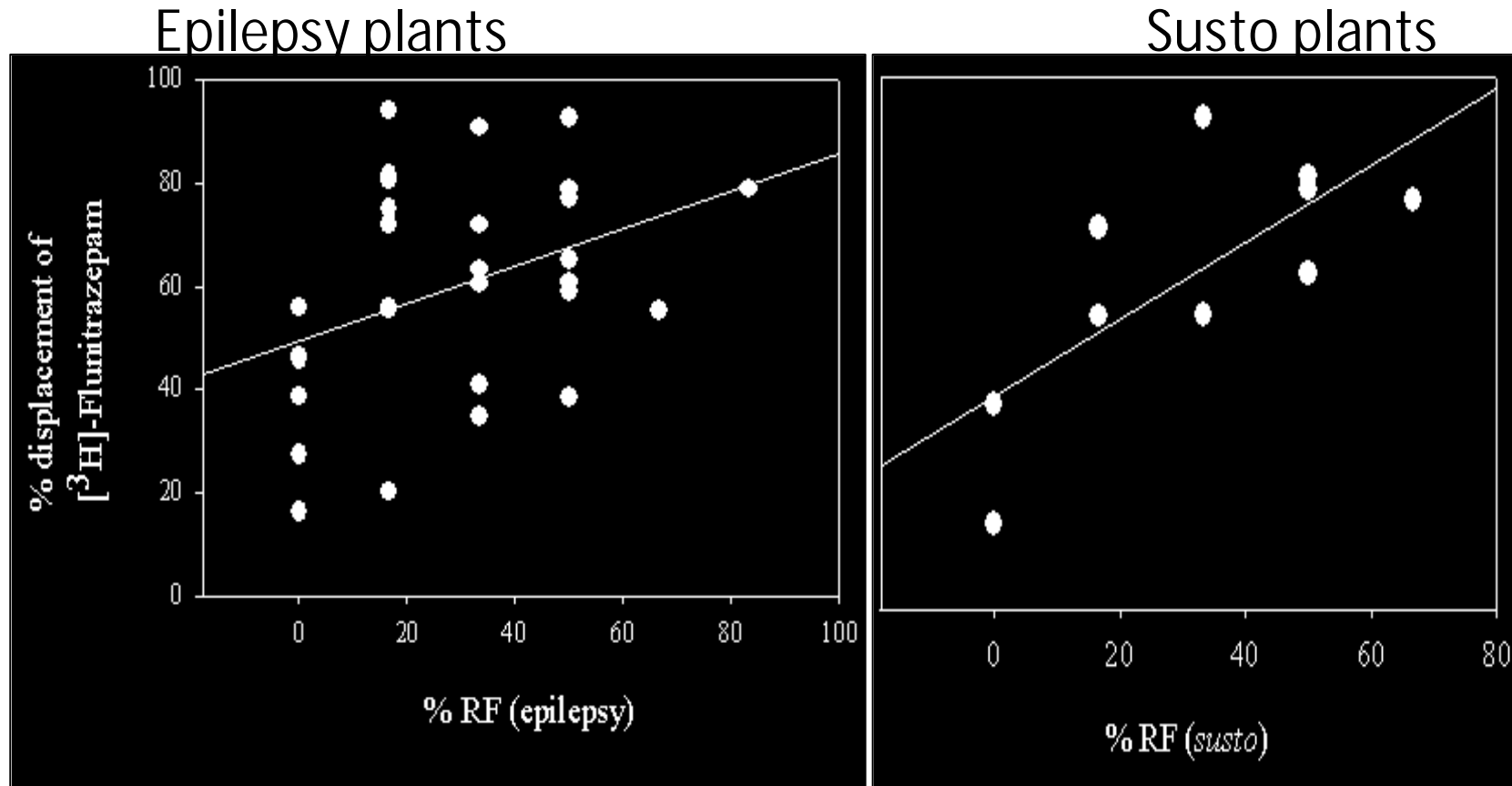


GABA system



Adapted from Treiman 2001

Correlation analysis of GABA_A activity (% displacement) and % relative frequency (RF) of plants used by healers



for (A) epilepsy, $r = 0.383$, $r^2 = 0.147$, $p < 0.05$ ($n = 31$) and
(B) *susto*, $r = 0.728$, $r^2 = 0.530$, $p < 0.02$ ($n = 10$).

Souroubea spp. of the Marcgraviaceae : among the most promising anxiolytics and targeted as a rare family by Poveda & Sanchez



Anxiety Summary

- Anti-Anxiety plant use by Maya has a pharmacological basis in GABA A receptor binding

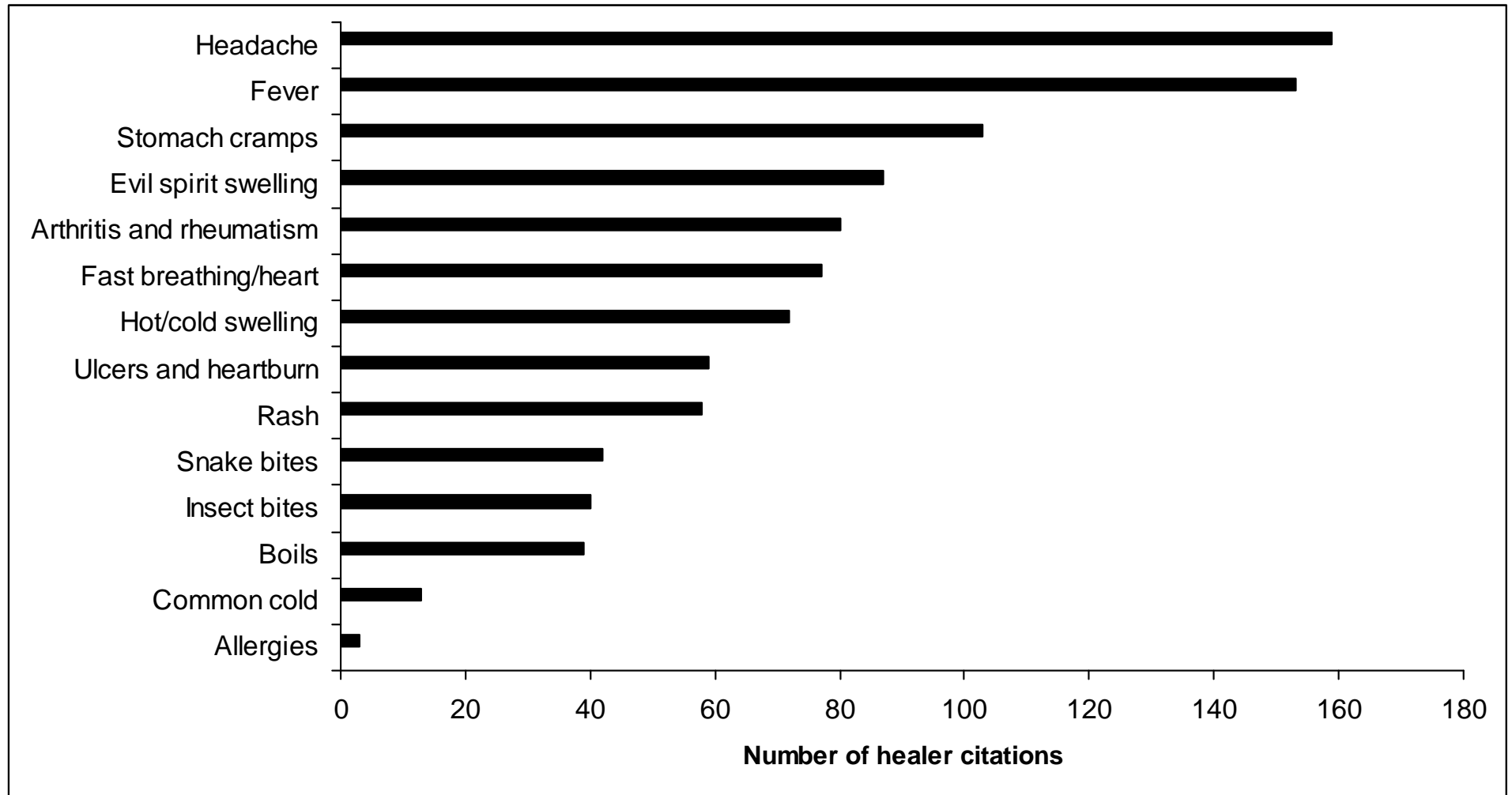
Plants used in inflammation

- Brendan Walshe-Roussel
- Collaboration with healers to identify plants used for symptoms of inflammation
- Test in lab assays
 - Anti-inflammatory bioassay
 - Bacterial LPS stimulation
 - TNF-alpha ELISA

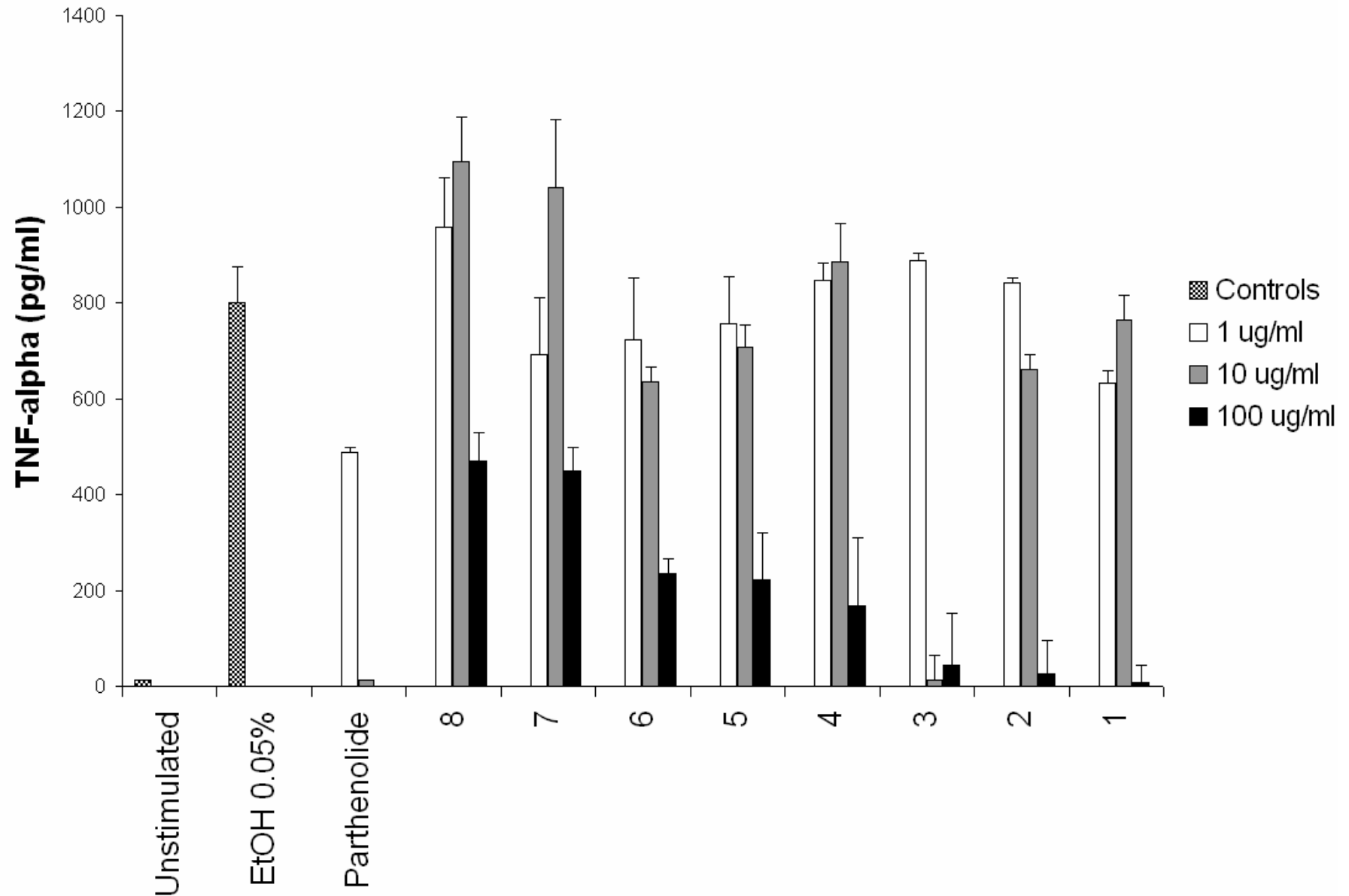


Healer Interviews

Ethnobotanical Results



Anti-inflammatory Plants



Hot and Cold

Table II. Hot-Cold Classification of Medicinal Plants in the Groups of Uses^a

Group of use	Hot (%)	Cold (%)	<i>n</i> _{tot}
Gastrointestinal disorders	65	45	101
Dysentery	4	96	27
Diarrhea	67	33	18
Vomiting	77	23	56
Dermatological conditions	29	71	35
Infection	4	96	24
Pimples	82	18	11
Women's medicine	88	12	25
Pain and fever	26	74	23
Respiratory illnesses	53	47	19
Bites of venomous animals	—	100	13

^aFigures in italics: $\geq 70\%$ of the total number of individual use reports; two responses: urological problems, Illnesses of the eyes, Other uses.

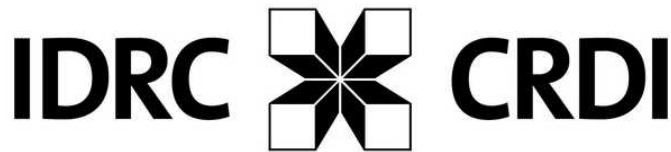
Antidiabetic plants

KMHA and Jonathan Ferrier: 15 symptoms used



Acknowledgements

- Q'eqchi' Healers Association
- Belize Indigenous Training Institute
 - Victor Cal
- Funding Agencies



Maya Calendar

Long Count

Glyphs represent periods of time

k'in = day

winal = 20 day month

tun = 360 day long count year (18 *winal*)

katun = 7200 days (20 *tun*)

baktun = 144000 days (20 *katun*)

The next long counts end in
13.0.0.0.0, or Dec 21, 2012

Representing a new age



In Memory Of Kevin

